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Rule-Governed Behavior and Behavioral Anthropology

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According to cultural materialism, cultural practices result from the materialistic outcomes of those practices, not from sociobiological, mentalistic, or mystical predispositions (e.g., Hindus worship cows because, in the long run, that worship results in more food, not less food). However, according to behavior analysis, such materialistic outcomes do not reinforce or punish the cultural practices, because such outcomes are too delayed, too improbable, or individually too small to directly reinforce or punish the cultural practices (e.g., the food increase is too delayed to reinforce the cow worship). Therefore, the molar, materialistic contingencies need the support of molecular, behavioral contingencies. And according to the present theory of rule-governed behavior, the statement of rules describing those molar, materialistic contingencies can establish the needed molecular contingencies. Given the proper behavioral history, such rule statements combine with noncompliance to produce a learned aversive condition (often labeled fear, anxiety, or guilt). The termination of this aversive condition reinforces compliance, just as its presentation punishes noncompliance (e.g., the termination of guilt reinforces the tending to a sick cow). In addition, supernatural rules often supplement these materialistic rules. Furthermore, the production of both materialistic and supernatural rules needs cultural designers who understand the molar, materialistic contingencies.

Key words: rule-governed behavior, behavioral anthropology, radical behaviorism, cultural materialism

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We may be at the right place at the right time to take part in the evolution of a new interdisciplinary effort—behavioral anthropology, the analysis of culture in terms of the principles of behavior. As this issue of *The Behavior Analyst* bears witness, several behavior analysts have shown an interest in anthropology, mainly in the materialistic cultural anthropology of Marvin Harris (also Lloyd, 1985; Malagodi, 1986; Stoutimore, 1986; Vargas, 1985). And at least one anthropologist has shown an interest in behavior analysis—Marvin Harris (1986, May).

I think the general goal of behavioral anthropology should be to answer the question: How do we explain the evolution and maintenance of cultures, in terms of the behavioral contingencies acting on the individual? I will illustrate this question with a few of Harris's favorite "riddles of culture"—paradoxes and examples, such as the Hindu beef taboo, the universal incest taboo, and prestate warfare. As the beginning of an answer, I will suggest that rule-governed behavior plays a major role in the evolution and maintenance of these cultural patterns (Glenn, 1987, makes a similar suggestion). By culture, I mean, socially acquired values and repertoires or, as Harris (1983) puts it, "the learned, socially acquired traditions and lifestyles of the members of a society, including their patterned, repetitive ways of thinking, feeling, and acting (i.e., behaving)" (p. 5).

This article will address the following issues: (1) the evolution and maintenance of the Hindu beef taboo, from a traditional anthropological view, from Harris's cultural-materialistic view, from a traditional behavioral view, and finally from a radical behavioral view with an emphasis on rule-governed behavior; (2) other examples supporting a radical behavioral analysis of the evolution of culture; (3) further applications of behavioral analysis to an understanding of the materialistic basis of religion; (4) whether cultural designers are necessary; (5) whether behavioral anthropologists are necessary, and (6) Harris's conceptual structure as viewed from a radical behavioral perspective.

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THE MAINTENANCE OF CULTURE: THE SACRED COW

A Traditional Anthropological Analysis

Much academic study of religion and culture seems to be designed to show that, although scientists may think they understand the physical world, there are some things scientists will never be able to "put in their test tubes": the human mind, the human spirit, the universal mystical forces. As Harris (1974) says,

> Ours is an age that claims to be the victim of an overdose of intellect. In a vengeful spirit, scholars are busily at work trying to show that science and reason cannot explain variations in human lifestyles. . . . We have been taught to value elaborate "spiritualized" explanations of cultural phenomena more than down-to-earth ones. (pp. 1–2)

Many anthropologists claim that their subject matter is "world views, symbols, values, religions, philosophies, and systems of meanings" (Harris, 1983, p. 326). They tend to value more the myths and legends of a culture than the activities of the participants in that culture. "Each lifestyle comes wrapped in myths and legends that draw attention to impractical or supernatural conditions" (Harris, 1974, p. 3). To the extent that those advocating a traditional approach consider behavior, it is to emphasize the irrational actions of human beings as being evidence of the expression of the human spirit or of the individualistic or cultural personality that underlies those actions ("you know how those Indians are"). They consider thought, human spirit, and personality to be something above and beyond action or behavior and not reducible to those baser elements.

For example, Harris (1974) presents the traditional view of the Hindu taboo on cow slaughter:

> The picture of a ragged farmer starving to death alongside a big fat cow conveys a reassuring sense of mystery to Western observers. . . . Westerners find the idea that there might be a practical explanation for Hindu love of cow more upsetting than Hindus do. (p. 6)

The high reinforcer value of the irrational may be why, as Harris (1974) points out, many experts claim, "cow worship is the number one cause of India's hunger and poverty. . . . And an economist from the University of Pennsylvania stated in 1971 that India has thirty million unproductive cows" (p. 7).

Thus a traditional anthropological analysis suggests that strongly held religious values generate materialistically irrational cultures such as the culture of the sacred cow.

A Cultural Materialistic Analysis

On the other hand, Harris (1974), sounding more like a systems analyst than my stereotype of an anthropologist, points to the following materialistic benefits of owning a cow: A cow is "a factory for making oxen" (p. 10). A cow is a factory for making manure for fertilizer, for heat, and as part of a flooring material. "India's cattle annually excrete about 700 million tons of recoverable manure" (p. 13). A cow is the poor farmer's life insurance.

The dry and barren cow may be a last desperate defense against the moneylenders. There is always the chance that a favorable monsoon may restore the vigor of even the most decrepit specimen and that she will fatten up, calve, and start giving milk again (p. 14). The ox is also life insurance: "When an ox falls sick, a poor farmer is in danger of losing his farm" (p. 10).

Harris (1974) then argues that the sacred cow is not only an effective life-support system but a cost-effective one as well: The cows mainly eat "inedible byproducts of human food crops" (p. 19). So keeping a few absolutely useless older cows is a small price to pay (p. 16). Even so, not that many are kept, because slaughterhouses do exist to sell beef to non-Hindus (p. 18). Furthermore, the farmers judge 30% of the female cattle (young calves and old cows) not to be cost-effective; the farmers then "accidentally" allow them to die (p. 23). And those cattle that do not die in the slaughterhouses manage to end up, cost-effectively, on the plates of low-ranking castes "whose members have the right to dispose of the bodies of dead cattle" (p. 17).

As a final utilitarian surprise, Harris tells us that "despite cow love, India manages to have a huge leathercraft industry" (p. 18).

Some fundamentals of cultural materialism. The preceding analysis illustrates the fundamental principle of cultural materialism: Cultural practices tend to result from materialistic causes. To elaborate: Practices will be more likely to survive if they aid the survival of the group. And practices will aid the survival of the group if those practices are cost-effective producers of essential material goods, or if they support practices that are cost-effective producers of essential material goods. "Cultural evolution, like biological evolution, has (up to now at least) taken place through opportunistic changes that increase benefits and lower costs to individuals" (Harris, 1980, p. 61). So materialistic outcomes determine the basis of culture even though "each lifestyle comes wrapped in myths and legends that draw attention to impractical or supernatural conditions" (Harris, 1974, p. 3).

A Traditional Behavior Analysis

I believe Harris has made a plausible analysis of the sacred cow phenomenon in terms of the fundamentals of cultural materialism. Now the question is, how do we explain the maintenance of the culture of the sacred cow, in terms of the behavioral contingencies acting on the individual human being?

At first glance, the answer might seem simple. The cultural practices of raising and protecting cattle are nothing but a set of behaviors, and these behaviors all tend to produce more reinforcers and fewer aversive outcomes for the practitioners. These behaviors of raising and protecting cattle produce traction animals essential for the production of grain; and they produce fertilizer, fuel, flooring material, milk, and ultimately meat and leather. So this might appear to be a simple example of reinforcement by the presentation of reinforcers.

What happens to the behavior of killing cattle? That behavior results in the loss of the traction animal or the bovine factory for producing traction animals, fertilizer, fuel, flooring, and milk. So this might appear to be a simple example of punishment by the removal of reinforcers (response cost).

According to this traditional behavior analysis, the natural outcomes of cultural practices reinforce or punish those practices and thus determine the maintenance of those practices. This traditional analysis argues that the contingencies described by cultural materialism are the straightforward, direct-acting contingencies of operant conditioning.

A Radical Behavioristic Analysis

Before doing an analysis of the culture of the sacred cow from a point of view of radical behaviorism, we need to consider, in some detail, the problem of delayed outcomes, rule-governed behavior and its relation to delayed outcomes, the types of contingencies involved, and the importance of knowledge of those contingencies.

The problem with delayed outcomes. The traditional behavior analysis of the culture of the sacred cow overlooks one crucial issue—a feature of the contingencies involving the natural reinforcers contingent on rearing the cattle and the natural penalties contingent on killing them. Those reinforcers and penalties are almost always too delayed to reinforce or punish the causal actions—that is, those reinforcers and penalties are not involved in *direct-acting contingencies.* For example, consider the following reinforcers: fertilizer, fuel, flooring, milk, offspring, and plowed fields; those reinforcers are contingent on the acts of tending the cattle, but the presentation of those reinforcers usually follows that tending by anywhere from several minutes to several months.

An increasing number of behavior analysts agree that such delays are too great to reinforce the acts of tending. (See Malott & Garcia, in press, for a review of the literature on delayed behavior consequences.) As Michael (1984) notes, "Whenever our behavior is affected by

consequences that occur more than a few seconds after the behavior and where bridging stimuli are not present, the effect cannot generally be interpreted as the direct result of the consequences" (p. 118).

Furthermore, Michael (1986) points out that we should not appeal to stimulus-response chaining in an effort to account for the control of delayed consequences. Such an appeal assumes there is a reliably repeated, uninterrupted chain of stimuli and responses connecting the response of concern to the delayed consequence of concern. But this is not likely.

A similar critique applies to the use of the concept of punishment by the removal of reinforcers in the analysis of the low frequency of the killing of cattle. So it does not seem likely that this set of cultural practices is a result of the operant conditioning of its components using natural, materialistic contingencies.

Rule-governed behavior and delayed outcomes. Instead of treating the materialistic cultural contingencies as direct-acting contingencies of reinforcement and punishment, I propose that the sacred cow phenomenon consists of a culture prescribed by a set of rules.

Most of the radical behavioral analyses in this article make use of the behavioral concept of rule. A few comments about the concept seem in order before dealing with the analysis itself.

By *rule* I mean a verbal description of a behavioral contingency. For example, "If you touch that stove when it's hot, you'll burn yourself," or "Tell that joke to Jim, he'll like it." A behavioral contingency consists of a response, an outcome, and a discriminative stimulus in the presence of which the response will produce that outcome. For example, in the presence of a hot stove, touching that stove will produce an aversive burn. Or in the presence of a receptive audience, telling a joke will produce a rewarding laugh.

This definition is only a slight extension of Skinner's 1969 formulation.... Although Skinner (1969) discusses rules merely as "contingency-specifying stimuli" (e.g., p. 157), his examples all involve verbal stimuli. Therefore, they seem in keeping with the present spirit of not considering simple, nonverbal stimuli as rules. For example, we would not consider an example of a rule to be the green key light associated with the opportunity for reinforcement of the key-peck response in the operant test chamber. (Malott, 1982, in press)

A rule can be in the form of a simple verbal description (Skinner's tact [1957, chap. 5])—"If you touch that stove. . . ." Or the rule can be in the form of a suggestion, request, set of instructions, or demand (Skinner's mand [1957, chap. 3])—"Tell that joke to Jim. . . ." In this latter case of the mand, the statement usually implies some additional behavioral contingency supporting compliance with the rule; for example, that additional contingency might involve social approval by the person who made the statement. Both types of rules are relevant to our analysis of culture; however, the general analysis is much the same for both types, so I will make little further distinction between them.

Rule-governed behavior is the behavior specified by the rule that occurs as a result of the statement of that rule. In trying to determine why the rule governs the behavior, behavior analysts generally point to the rule's function as a discriminative stimulus; but I find to be crucial the rule's overlooked role as an establishing operation (Michael, 1982). (We will soon return to this issue.)

Michael (1984) has also stressed the importance of rules in dealing with delayed outcomes:

> Within the last ten years it has become increasingly clear that much human behavior is rule governed rather than contingency shaped. Whenever our behavior is affected by consequences that occur more than a few seconds after the behavior and where bridging stimuli are not present, the effect cannot generally be interpreted as the direct result of the consequence, but is probably related to our ability to generate and to be affected by descriptions of contingencies. (p. 118)

Let me emphasize one crucial qualification. Many behavior analysts talk as if rules describing contingencies that are not direct-acting exert perfect control, once the person knows the rule. I am not among that group of behavior analysts. We need a prerequisite repertoire and set of values that are hard to come by—so hard that no one whom I have had the opportunity to observe for more than five minutes seems to have acquired that repertoire to a 90% reliability level. All people lose their rule governance some of the

time, and some people lose their rule governance all the time.

I think the prerequisite repertoire and values include: effective control by familiar rules stated by others; effective control by novel rules stated by others; a high probability that the person's performance will evoke accurate and timely self-evaluation; a high probability that the self-evaluation will evoke automatic or self-delivered reinforcement or punishment, as appropriate; effective reinforcers and aversive conditions for that automatic or self-delivered reinforcement or punishment; and the timely evocation of the self-statement of appropriate rules. These skills and values are all linked together in a precarious chain of necessary prerequisites, in which a momentary weakness in any one link will cause the entire chain to break (see Malott, in press, for more details).

One might raise the following objection to the notion that the rule is always needed with delayed outcomes: Suppose a delayed, aversive outcome always follows a particular response. Then the stimuli that response immediately produces would become learned aversive stimuli. And those stimuli would automatically punish that response. This objection would be relevant, if we were indeed punishing the behavior. But I am suggesting that punishment does not occur when the contingent aversive stimulus follows the causal response by a long interval. Similarly, I suggest that the stimuli immediately produced by the response do not become learned aversive stimuli when there is that large delay between those response-produced stimuli and the aversive outcome. So we still need rules, if delayed outcomes are to control our behavior.

True, delayed outcomes can sometimes change the frequency of the causal response without the intervention of rule governance. But I think such changes are not examples of changes in repertoire. For example, suppose a person accidentally leaves on the gas stove without lighting it. And suppose that after the person leaves home, an electric spark ignites the gas and blows up the house. The person will no longer be able to leave that particular gas jet on again. A delayed, materialistic outcome has affected the frequency of future responses of leaving on the gas stove. But that outcome has done so by preventing the opportunity for future responses. This change in behavior is no more a change in repertoire or values than would occur if we took a rat out of the test chamber at the end of the session and noted that, once outside the chamber, it no longer pressed the lever. (On the other hand, if the formerly negligent home owner did become reliably more conscientious in a future home, when the opportunity to make the devastating response was again present, I would suspect rule-governed behavior had come into the picture. If the home owner were a languageless chimpanzee, with no rule-governed behavior, I doubt if he or she would profit from the unfortunate experience—I doubt if the home owner would become more conscientious.)

Types of contingencies and their importance for rule control. There are two general types of behavioral contingencies—those that are direct-acting and those that are not. Contingencies that are *direct-acting* involve outcomes that are sufficiently immediate, probable, and sizable as to reinforce or punish the preceding, causal response (e.g., the delicious taste of ice cream made from the milk of the sacred cow would reinforce the eating of that ice cream).

Those contingencies that are *not direct-acting* involve outcomes that are either too delayed, too improbable, or too small, though they may be of cumulative significance (e.g., the harmful effects of each individual bite of that ice cream are too small to punish that bite). There are also two types of contingencies that are not direct-acting—those that are indirect-acting and those that are ineffective in controlling behavior (of course, direct-acting contingencies are also effective).

I assume that *indirect-acting contingencies* must control behavior through other contingencies that are, themselves, direct-acting. Aside from direct, social

intervention, there are two types of indirect-acting contingencies—those described by rules that are easy to follow and those described by rules that are hard to follow.

Rules that are *easy to follow* describe contingencies involving outcomes that are probable and sizable, though those outcomes may be delayed (e.g., "If you don't take your calf to market today, you won't be able to sell it until next week, and you'll need the money before then"). I assume that the rule statement combines with the farmer's momentary noncompliance to set up a learned aversive condition (often called guilt, shame, a sense of sinfulness, or fear). Of course, the establishment of this learned aversive condition requires a history of aversive stimulation having been paired with noncompliance with stated rules. I further assume that, in the present case, the direct-acting contingency involves something like automatic reinforcement from the compliance-contingent reduction of that aversive stimulation. This reduction of an aversive condition is like the reduction in the guilt or fear that reinforces your finally getting around to grading those term papers. (For additional comments on the behavioral history of punishment that establishes the aversive conditions of guilt, shame, a sense of sinfulness, and fear, and for comments on their role in social control, see Skinner's analyses [1953, pp. 187–188, 235, 325, 337, and 361].) (I should point out that the reinforcing reduction of an aversive condition that I have been assuming is often called *negative reinforcement,* though I will avoid this terminology because it seems to confuse all but the happy few; and perhaps such terminology plays a small role in preventing the happy few from becoming the satisfied many.)

Even though most writers analyze the problems of self-control in terms of delayed outcomes (e.g., delayed gratification), I think such an analysis misses the real problem. True, delayed outcomes mean that the contingency will not be direct-acting; that is, the contingency will not reinforce or punish the response that produced that delayed outcome. But the delay of the outcome does not make it hard for us to follow rules. For example, we will have no trouble putting a frozen turkey in the microwave, even though it must cook there for a considerable time before it is done. We need not make an especially impressive display of self-management to cope with that 3-hour delay.

Rules that are *hard to follow* describe contingencies involving outcomes that are either improbable or small (and of only cumulative significance). Let us first consider rules specifying contingencies with *small but cumulatively significant outcomes.* Such rules are hard to follow, regardless of whether those outcomes are immediate or delayed (e.g., if you read those difficult and tedious textbooks on animal husbandry, you will be able to help your fellow farmers breed better cows). Such contingencies often involve no deadlines (i.e., limited holds) and thus allow for procrastination.

As another example, we have trouble following health rules (e.g., daily dental flossing). Why? Again, not because the outcome is too delayed; depending on how negligent we have been, we may immediately remove some plaque with each stroke of the floss. We have trouble only because the outcome is too small; its value is only of cumulative significance. The outcome from one stroke of floss, or an entire session's strokes, is too small to reinforce flossing. Only weeks or months of daily flossing keep the teeth clean enough for long enough to have an appreciable effect on the amount of periodontal disease.

These contingencies have only small, though cumulatively significant, outcomes. For them to control behavior, even indirectly, they need the support of a rule describing an additional contingency; and that rule must be of the easy-to-follow variety (e.g., "If you don't get your cow inoculated today, you will definitely be the recipient of a sizable supernatural outcome that you will have wished you had not received"). Here is what I assume is the reason this supernatural rule is easy to follow: Its statement, describing the additional contin-

gency, establishes an effective aversive condition; the person can then escape this aversive condition by complying with the supernatural rule; and this escape response just happens to be the one that has the desirable materialistic outcome—for example, the cow finally gets inoculated.

Now let us briefly consider rules specifying contingencies that have *improbable outcomes.* We have trouble following safety rules (e.g., buckling up). Why? Not because the outcome is too delayed; we might be injured as soon as we back out of our garage. We have trouble only because the outcome is too improbable. State seat-belt laws greatly increase buckling up by increasing the probability of an aversive outcome for noncompliance; this buckling up occurs, even though the size of that aversive event (a small fine and a few points on our driver's record) is much less than the permanent injury or death involved in the natural contingencies with their extremely low probabilities.

The *ineffective contingency* is the second type of contingency that is not direct-acting. (The first type was indirect-acting.) Though ineffective contingencies may involve important outcomes, they can fail to control behavior for two reasons:

One reason can be that no rule exists to describe the ineffective contingency. No one is aware of the contingency (e.g., 100 years ago, no one was aware of the relation between eating a well-fed sacred cow and the buildup of cholesterol).

The second reason for ineffective contingencies can be that the contingency is described by a rule that is hard to follow and no easy-to-follow rule supports it (e.g., "Each bite of the sacred cow paints a minuscule but cumulatively lethal amount of plaque on your arteries, and God doesn't care"). Note that this particular rule happens to be of the tact rather than the mand variety. Incidentally, this rule would be hard to follow, even without the contingencies of reinforcement for beef eating implied in McDonald's advertisements; it would be hard simply because the harmful outcome of each bite of beef or even each meal of beef is too small to effectively punish beef eating. (Figure 1 shows the hierarchical relation among these concepts.)

Of chief concern to the present analysis is the assumption that whenever an indirect-acting contingency effectively controls behavior, a direct-acting contingency is hiding some place in the background doing the real work. (For more detailed discussions of the contingencies supporting rule-governed behavior, see Malott, 1984, 1986, in press.)

Does the individual need knowledge of the contingencies? Note that I am not saying we must have knowledge of direct-acting contingencies (the contingencies of reinforcement and punishment) for those contingencies to control our behavior. As Skinner (1974) points out, "We do not need to describe contingencies of reinforcement to be affected by them. Lower organisms presumably do not do so, nor did the human species before it acquired verbal behavior" (p. 141).

An early, human-operant, laboratory example is the study by Hefferline, Keenan, and Hartford (1956). They conditioned an invisibly small, covert thumb twitch by turning off an aversive noise or postponing that noise, whenever their human subjects twitched a thumb ever so slightly. The subjects were completely unaware of what was going on—no knowledge, no rules; just pure, preverbal, animal-like conditioning (i.e., they could not describe the contingencies of reinforcement, when later asked to do so). But the experimenters were only able to do this conditioning because occasionally a thumb twitch immediately turned off the noise. If there had been a 3-hour delay between the response and the delivery of the reinforcer (noise off), they would not have gotten the increased frequency of thumb twitches. (I am using *awareness* of a stimulus or event in the sense of being able to tact or verbally describe that stimulus or event [Malott, General, & Snapper, 1973, chap. 6; Malott & Whaley, 1976, chap. 22; Skinner, 1974, pp. 220–221] and I am using *knowledge* and *awareness* as rough syn-

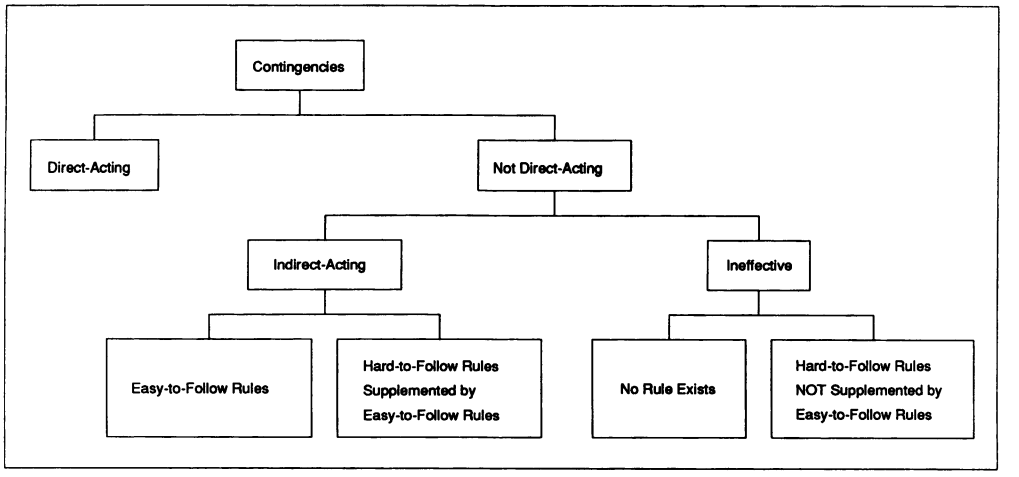

Figure 1. The relationship between terms used to analyze rule-governed behavior.

onyms [see Skinner, 1974, chap. 9, for various uses of the term *knowledge*].)

But we do need the immediate delivery of some reinforcing or aversive condition for our behavior to be controlled. So when the materialistic contingency does not provide that immediate delivery, we do need an awareness of rules, either materialistic, social, or supernatural. The statement of those rules acts as a motivating operation that establishes an aversive condition whose termination will reinforce compliance and whose presentation will punish noncompliance.

Rule-governed behavior and the sacred cow. With the preceding extensive background in rule-governed behavior, we are now ready to consider the sacred cow in more detail. The rules of the culture of the sacred cow might specify materialistic outcomes; for example, "If you kill your oxen during the drought, you won't be able to plow your fields when the rains finally do come." However, to the extent that the cow is a sacred cow and not just a materialistic cow, the rules must specify supernatural outcomes; for example, "If you kill your oxen during the drought or any other time, for that matter, your next few reincarnations will be less than desirable."

Those rules consist of two sorts, rules prescribing actions, such as the proper tending of the cow, and rules prohibiting actions, such as the killing of the cow. Suppose a Hindu farmer finds himself tending his cattle less than the cultural rules recommend, and suppose he states those rules for the tending of the sacred cows. Then, given the proper behavioral history, the combination of his neglect and the statement of the rules will generate the learned aversive condition often called guilt, shame, a sense of sinfulness, or fear; taking proper care of his cattle will reduce this learned aversive condition; and that reduction of aversiveness will reinforce his compliance with the cow-care rules.

In an analogous manner, compliance with rules prohibiting the killing of cattle is maintained through punishment of noncompliance by the presentation of an aversive condition, again, like guilt or fear.

For both sorts of rules, failure to comply generates the aversive condition of guilt or fear, because in the past, such failures have been paired with the threat of materialistic, social, or supernatural sanctions for failure to comply. The promise of materialistic, social, or supernatural rewards may also help to support compliance; however, that support may simply be in the form of the enhancement of the aversiveness of noncompliance: if you do not comply, you will lose the opportunity to collect those promised rewards.

Another way to stress the importance

of rules is to point out the low probability that the sacred cow would stand a chance in a nonverbal culture, that is, one without rule-governed behavior. The cow would soon be either neglected or led to slaughter, regardless of any long-range, materialistic benefits that might follow from keeping it alive.

Now the traditional behavior analyst might make the following counterargument, in an effort to downplay the importance of verbal behavior and its resultant rule control: Nonverbal animals seem to find it aversive to part with their food; for example, try taking a sacred-cow bone away from Rover. Perhaps this suggests that nonverbal animals would also not slaughter sacred cows and, therefore, such cultural practices do not need the support of rule control. But Rover's refusal to share a few chews of the sacred-cow bone does not suggest that he himself would refrain from the chewing. Thus we should not take Rover's frustration-induced aggression as evidence for the possibility of a nonverbal culture of the sacred cow.

The traditional behavior analyst might also make this argument against the need for rules: Good nonverbal experiences with one's cows can establish those cows as learned reinforcers. So the threat of loss of the cows would be too aversive to bear, even without rule control. But, in spite of the most tender of nonverbal experiences between young 4-H members and their prize steers, after the livestock judging contest, they proudly sell those pets for slaughter, albeit with an occasional tear. Even with such tender relations, we do not have an optimistic picture of the fate of the sacred cow in a nonverbal culture—one deprived of the benefits of rule control.

Incidentally, the cultural rules usually specify outcomes that are also too delayed to reinforce compliance or punish noncompliance, regardless of whether those outcomes are materialistic, social, or supernatural. So the outcomes specified by the rules are not usually the ones that reinforce compliance and punish noncompliance.

Let me summarize and amplify slightly this radical behavioral analysis of the maintenance of the sacred cow: The natural, materialistic contingencies are not direct-acting (i.e., they are based on outcomes that are too delayed to reinforce the tending of the cow and also too delayed to punish the killing of the cow). Therefore, direct-acting contingencies of reinforcement and punishment must also be present. Those direct-acting contingencies result from the statement (often a self-statement) of rules specifying proper behavior pertaining to the cow. Those rules act as motivating or establishing operations, setting up learned aversive conditions that reinforce rule compliance and punish noncompliance. These learned aversive conditions probably result from a history of punishment for failure to comply with certain general classes of rules. Most often, that punishment would be socially mediated; for example, by the parents of children as the children acquire rule-governed behavior.

The traditional analysis is most compatible with the philosophical position known as methodological behaviorism, with its abhorrence of inferences of private events. I call the present analysis a *radical behavioral analysis,* because of its reliance on the self-statement of rules and automatic reinforcement by the reduction of learned aversive conditions. However, not all who consider themselves radical behaviorists would be as willing to assign so important a causal role to private events in their natural science. (For more discussion of these philosophical issues, see Malott and Garcia, in press.)

In a related analysis, Glenn (1986) says, "Verbal behavior provides a critical link between contingencies and metacontingencies [the molar contingencies of cultural materialism]. . . . Verbal behavior in the form of rules bridges the gap between behavior and long-term consequences" (p. 3). But be careful not to take the gap-bridging metaphor to mean that the person mediates between the response and its delayed reinforcer by stating rules to himself or herself during the delay. I argue that, even with rules, the delayed reinforcer never reinforces the

relevant, causal response. Instead, the rule statement establishes the stimuli associated with noncompliance as an aversive condition; and a reduction of those aversive stimuli in turn reinforces compliance, while an increment in those aversive stimuli punishes noncompliance.

THE EVOLUTION OF CULTURE: THE SACRED COW

A Cultural Materialistic Analysis

Harris (1985, chap. 3) presents a history of the evolution of the culture of the sacred cow: The population had grown and the land had been depleted to the point where the population had exceeded the carrying capacity of the environment. The people would have to make more efficient use of their land, if they were to support their growing numbers. That meant they would have to use their land to produce crops for direct human consumption, rather than first running those crops through cattle and then eating the cattle. However, "the priviledged Brahmans and Kshatriyas continued to slaughter cattle and gorge themselves on beef long after it was impossible to invite ordinary people to share in their good fortune" (p. 53). And "to obtain cattle for their gluttonous feasts, . . . taxation, confiscation, or other coercive measures would have been necessary once the peasants were unable or unwilling to donate surplus animals to the temples" (p. 55). At that time, many different religious leaders developed popular religions with rules prohibiting the killing and thus the eating of cattle, and those "nonkilling religions had great mass appeal" (p. 55). They appealed to the masses whose few remaining cattle were being eaten by the elite.

As we saw, the materialistic analysis of the maintenance of culture is this: A culture's practices tend to be those that result in materialistic benefits for the group. So a materialistic analysis of the evolution of culture is that a culture evolves when the environment changes in such a way that the old practices will no longer provide for the material needs of the group and the new practices will, or at least will come closer to doing so. (Perhaps instead, we should say the materialistic benefits to the influential, powerful subgroups determine the culture's practices, even when those practices may be harmful to the larger group. Harris [1985] makes that point: "In market economies such as the United States, good to eat may mean good to sell, regardless of the nutritional consequence" [p. 16]. "Long before there were kings, capitalists, or dictators, lopsided allocations of costs to women and children and of benefits to men and adults were not uncommon" [p. 17]. "In beef-eating nations like Mexico and Brazil, . . . beef cattle are now eating better than from one-third to one-half of the people at the bottom of the social pyramid" [p. 64].)

A Traditional Behavior Analysis

Now the question is: How do we explain this evolution of the culture of the sacred cow, in terms of the behavioral contingencies acting on the individual human being? Again, at first glance, the answer might seem simple. A traditional analysis suggests that the culture of the sacred cow evolved in the same way as the cow herself evolved—through random mutations, though here the mutations would be cultural, not biological. The traditional analysis suggests that the contingencies of cultural materialism took those random mutations and, through reinforcement, punishment, and extinction, shaped the cost-effective culture of the sacred cow, just as the contingencies involving a full bucket of milk shape the skilled milking of that cow. In other words, a traditional behavioral analysis suggests that random behavioral mutations are shaped through differential reinforcement, punishment, and extinction based on the materialistic contingencies described by cultural materialism.

A Radical Behavioristic Analysis

The materialistic contingencies of cultural materialism are not direct-acting. A problem with the preceding traditional behavior analysis is that the analysis does not specify the behavioral contingencies

operating on the individual. In addition, we have already seen that the materialistic contingencies are too delayed to directly maintain the practices associated with cow worship. And the *acquisition* of those practices may be even less appropriately understood in terms of direct reinforcement by the natural outcomes. This is so because, in comparison with maintenance of a repertoire, acquisition of a repertoire is a more fragile process requiring maximally effective contingencies of reinforcement.

Furthermore, in contrast to the traditional behavior analysis, I suggest that the new cultural practices did not result from random mutation. A few poor farmers did not just happen to refuse to give up their cattle. Instead, the farmers induced a materialistic rule: "If I give up my cattle, I'll be in serious trouble with my farm." Failure to comply with that and related materialistic rules must have set up an aversive condition (e.g., fear, anxiety, guilt) whose termination reinforced proper care and preservation of the materialistic cow. I object to the random cultural-mutation part of the analogues to biological evolution and operant shaping. Instead, I suspect the cultural change from carnivorism to vegetarianism resulted from conscious, planned, rule-governed behavior from those who made the change.

This does not mean the diet did not change gradually, as the number of meatless days per week evolved from none to seven. It does not mean complete vegetarianism was the ultimate, planned destination of the earlier generations of farmers who started down that road. And it does not mean that those farmers who failed to change their ways had no trouble surviving and producing sufficient descendants to carry on their obsolete carnivorous tradition.

Less adaptive biological mutations extinguished, leaving the sacred zebu cow (the hardiest breed) to graze alone. Less productive milking responses extinguished, leaving an efficient response sequence. And the cultures of human carnivores, with their less effective practices, extinguished, leaving the members of the culture of the sacred cow as the cows' sole proprietors.

The flippant tone of these metaphors should not hide the great suffering and tragedy that accompanies most cultural changes of this sort. Evolution is no less painful than revolution, just more gradual.

The sacred cow followed rather than preceded forced vegetarianism. Harris's history suggests that materialistic constraints forced the culture of vegetarianism on the masses of poor farmers. He points out that only after vegetarianism was well under way were the religious prescriptions adjusted to these new materialistic practices. This adjustment came as various religious leaders actively proselytized those masses of poor farmers, those who had no cattle to spare for meat on their own table, those who resented their sole traction animal or their sole source of milk being confiscated and served as meat on the table of the privileged Brahman few. As Harris (1985) puts it, "I have yet to encounter a flourishing religion whose food taboos make it more difficult for ordinary people to be well nourished" (p. 87).

The reinforcement of cow worship. The sequence from materialistic practice to religion, in turn, suggests one reason for the evolution of new religions. It is a reinforcer to hear that our practices (e.g., deprivation-enforced vegetarianism) not only conform to the materialistic realities of our current life but will also produce desirable outcomes in our later lives. It is also a reinforcer (escape from guilt or fear) to no longer hear that those practices will get us in supernatural trouble, contrary to the warnings of a previous religion. This would apply to the poor farmer who cannot afford to sacrifice his cow to the Brahmans, in keeping with his old religion; he may find it a special reinforcer to hear that there is a Buddha who would even *prefer* that he not sacrifice the cow. And for many of us, it may be even more of a reinforcer to hear that the practices of our oppressors (e.g., confiscating our cattle) will produce undesirable outcomes in their later lives. As Harris (1985) notes, "Religions gain strength

when they help people make decisions which are in accord with preexisting useful practices, but which are not so completely self-evident as to preclude doubts and temptations" (p. 77).

In addition, there is the Buddhist equivalent of the Western hellfire and brimstone; that equivalent is a less than optimal reincarnation. So we must remember the additional reinforcement of the *removal* of the aversive condition of hearing that one's nonparticipation in cow worship is producing negative supernatural sanctions. Therefore, reinforcement by the immediate presentation of reinforcers and the immediate reduction of aversive conditions directly maintains the person's participation.

The cow-worship culture and awareness of the materialistic molar contingencies. What about the original religious designers of the cow-worship culture? Were they also aware of the materialistic value of cow preservation? Did Buddha understand? If he was in touch with his environment well enough to generate such a powerful religion, it seems plausible that he was also sufficiently in touch to understand what every poor farmer understood.

But such an insight by the religious leaders may not have been necessary, because the religion's popularity with the farmers probably resulted from its supernatural rationalization of existing cow-care practices; and that rationalization did not require materialistically sophisticated religious leaders.

However, it would probably help the spread of such a religion if its designers understood the basis of the reinforcer value it had for the farmers—if the designers' actions were rule-governed. But a contingency-controlled analysis may also be plausible. For example, the immediate reactions of the audience might shape the verbal behavior of a religious leader, without the leader's even being aware of the shaping process. Nonetheless, if successful men and women of the cloth were cut from the same cloth then as now, they were probably quite aware of the reinforcing effects at least some of their actions had on their followers.

Perhaps the control of proper cow care gradually shifted from rules specifying materialistic outcomes to those specifying supernatural outcomes. And perhaps the farmers need a little, though evidently not too much, probing, before they can state the materialistic outcomes. But Harris's analysis of the sly tactics the farmers use to get rid of unwanted calves suggests that those farmers are as much in touch with the materialistic rules as they are with the religious ones. The farmers may be like faculty members arguing in faculty meetings for increased support for their programs, basing their arguments on semireligious, semimystical appeals to the common good, but often quite aware of the materialistic benefits that will come their personal way if their program gets its requested support.

Furthermore, even if by some quirk of opacity, the materialistic rules were not apparent to Buddha, they have been apparent to at least one of the more recent leaders. Harris (1985) quotes Mohandas Gandhi as saying: "Why the cow was selected for apotheosis is obvious to me. The cow was in India the best companion. She was the giver of plenty. Not only did she give milk but she made agriculture possible" (p. 65).

Summary of a radical behavioristic analysis. Consider both the maintenance and the evolution of the materialistically beneficial cultural practices of cow worship. Those practices involve materialistic contingencies that are too delayed to reinforce or punish the practices of the culture. So rules may govern those practices. Furthermore, because of their complexity and their opposition by other powerful concurrent contingencies (like those involving the taste of beef), it is unlikely that those rules could have evolved as a result of random cultural mutation. Therefore, they must have been developed by people who were quite aware of the materialistic contingencies. Even when people now state the rules in terms of supernatural, rather than materialistic outcomes, the original developers of those practices (the poor farmers) must have been aware of their materialistically beneficial outcomes. This

awareness must have been necessary (not merely helpful), because the natural contingencies of reinforcement and punishment not only would not have generated such practices but would have worked against those practices.

More generally, consider the evolution of cultural practices involving contingencies with outcomes that are *too delayed to reinforce or punish those practices.* (Note that this need not apply to practices involving contingencies with immediate reinforcers and aversive stimuli.) At some point, there must be designers of those cultural practices. Furthermore, those designers must be aware of the rules describing the materialistic contingencies that are not direct-acting; otherwise those contingencies will remain ineffective in controlling the behavior of the members of that culture. Incidentally, this analysis does not preclude the possibility that the designers of a particular cultural practice might consist of a large number of the members of that group, for example, all the poor farmers who still had cows. (Much of the remainder of this paper involves other examples aimed at testing the adequacy of this radical behavioristic analysis.)

THE EVOLUTION OF CULTURE: OTHER EXAMPLES

Other Examples of Cultural Practices with Delayed Outcomes

Folk medicine and the taboo on eating cattle are cultural practices whose materialistic outcomes are often too delayed to reinforce those practices. This suggests the importance of rule control not only for the maintenance of those practices, but also for their evolution. Let us now consider some other examples.

The modest hunters

> Hunters are active no more than one or two days a week; more frequent hunting under the goad of big-man redistributors would gradually deplete the harvestable animal bio-mass. Hence hunter-gatherer political-economic ideologies are more likely to insist that the successful hunter be modest and reticent about his productivity. (Harris, 1980, p. 81)

However, even if the hunter can detect the depletion of the harvestable animal bio-mass within a few days of the onset of excessive hunting, that depletion of resources will still be too delayed to punish the excessive hunting of any individual or group of individuals. But that depletion might not be too delayed to cause the hunters to generate rules about the materialistic consequences of excessive hunting.

So it does not seem likely that cultures that discourage intensification of production develop as a matter of random mutation that is then selected by the evolutionary contingencies operating on the group as a whole. At least, at the beginning of those practices, leaders must have known the materialistic rules. If the leader's behavior had not been governed by the materialistic rules addressing the dangers of overhunting, they would have had no reason to generate taboos for preventing overhunting. This is so because all the direct-acting contingencies and more easy-to-follow rules would have supported that overhunting.

The aggressive bachelors. In discussing the warring villages of the Amazon, Harris (1980) notes, "To encourage male aggressiveness, wives are withheld from junior males and awarded to dominant seniors" (p. 91). Now, I wonder if there is the causal relation the sentence seems to imply.

Even if we assume that such a practice does encourage male aggressiveness, and even if we assume that such a practice might help the survival of certain tribes that indulge in it, could the practice originate as a result of random cultural mutation? Probably not. The hypothesized resulting aggressiveness and increased effectiveness of the young warriors would be too delayed to directly reinforce the withholding of the wives. At least originally, the practice might have been governed by rules specifying the contingencies of group survival. Or the practice might have been governed by rules specifying some other materialistic outcomes, such as the benefit to the dominant senior males of having less competition for the wives; then its ben-

efits to the survival of the tribe might have been fortuitous.

> Prestate warfare probably does not regulate population through combat deaths but through its effect on the sex ratio, encouraging people to rear maximum numbers of males and minimum numbers of females. Thus prestate warfare occurs not simply as an aberration caused by the failure of the mode of production to provide adequate subsistence—a view of Marx (1937) surprisingly shared with Malthus. Warfare also occurs as a means of slowing population growth, conserving resources, and maintaining higher per capita levels of subsistence. (Harris, 1980, p. 69)

Harris suggests that one of the reasons for prestate warfare is that it reduces population growth or has reduced it in the past through the mechanism of selective female infanticide. But the benefits of population control are too delayed to reinforce the acts of female infanticide, not to mention the even more antecedent acts of committing war. So if its impact on female infanticide controls warring, then the early leaders must have known the rules describing the causal chain from war to female infanticide to population control to higher levels of subsistence. I suspect that knowledge of such convoluted causal sequences would be unlikely without the help of exceptionally perceptive scholars, like Harris.

However, it might be that those tribes that have warfare will be more likely to survive because they have smaller populations as a result of their female infanticide. In this way we could explain the existence of tribes that practice prestate warfare and its resultant female infanticide. But we would have to appeal to other causes for the occurrence of the wars themselves (e.g., the failure of the mode of production).

Incest taboos. Harris says the taboos against incest originated with hunters and gatherers who lived in small bands consisting of nuclear families and depended on "inter-band marital alliances" for a broader resource bank, for trading, and for allies in time of war.

> The investment of the incest taboo with so much guilt, anxiety, and symbolism reflects deep anxiety and ambivalence about the cost/benefits of incest; hence the need for unquestionable "sacred" social rules that cut through the ambivalence and prevent each new generation from repeating the trials and errors of past generations. (Harris, 1980, pp. 80–81)

This is another interesting problem. Are we simply talking about pure evolution by natural selection? Do those cultures that just happen to have an incest taboo therefore have a competitive advantage that makes them more likely to survive and perpetuate similar cultures? It seems unlikely, because it is hard to imagine how these types of complex cultural practices could start as a sort of random mutation (from earlier cultural practices that were irrelevant to the long-range contingencies under consideration). The reinforcer value of sexual stimulation is too strong. Sexual reinforcers would almost guarantee that we are biologically programmed for incest. (That is why we must have such strong social taboos and laws and why we still have problems with it.)

But suppose incest avoidance did happen to get started; would that abstinence continue because of reinforcement from the materialistic benefits it produces for the abstainers from incest? Or would that abstinence continue because of the punishment from the loss of materialistic benefits for the perpetrators of incest? I doubt if either of those processes would maintain abstinence; their associated benefits and penalties are too delayed. Such abstinence would still need the support of immediate contingencies of reinforcement and punishment. That may be why we have the establishment of rules—the incest taboos. The support the materialistic outcomes provide must be indirect, at best, because those rules of abstinence are of a religious, moral, supernatural nature, with little reference to materialistic outcomes. That is, it may be easier to control someone's behavior if you say, "You are going to hell if you practice incest, even once." It may be harder to prevent incest if you say, "In the long run, each time you practice incest you'll have a very small but cumulatively significant negative effect on your tribe's chances of survival."

(There is still a need for rule control even though incest between immediate

family members produces an increased frequency of stillborns, deformations, and other harmful traits, within one or two generations. The delay is still too great [9 months minimum] to punish incest.)

So once again, the question is: Just how did the rules prohibiting incest get established in the first place? Were tribal leaders able to state the functional relation between incest prohibition, interband marriages, and interband cooperation, without the help of a professional systems analyst? Did they then invent unchallengeable sacred rules to control the behavior of those whose abstinence would be less controlled by the cumulatively significant benefits to themselves and their tribe?

At this early point in the evolution of behavioral anthropology, one of the contributions of radical behaviorism to the enterprise is to point out problems of analysis that seem to have been overlooked. And our understanding of the function and importance of rule-governed behavior supports that contribution.

The Problem of the Low Operant Level

Thus far I have suggested that the materialistic contingencies for cultural practices are often not direct-acting (i.e., they cannot reinforce those practices). Instead the practices are rule governed, though those rules sometimes refer to supernatural contingencies rather than materialistic ones. There is one more reason reinforcement by materialistic contingencies would sometimes fail to account for the acquisition of cultural practices. In many instances, the operant level of the cultural practice is too low; in other words, the probability is too low that a cultural practice would arise by chance or for some irrelevant reason. And without some divine shaper, that practice would not occur often enough for the natural contingencies to reinforce that practice with sufficient frequency to cause it to be acquired.

Folk medicine. Folk medicine might be a good example. For many folk remedies, their preparation is elaborate and would be unlikely to occur by chance (i.e., the operant level is low). Therefore, the natural consequences of such preparations could not reinforce the stimulus-response chains comprising those preparations with sufficient frequency that the response-chains would be acquired. Their operant level might be so low that their chance concoction would be as unlikely as 1,000 monkeys sitting at 1,000 word processors for 1,000 years concocting *Behavior of Organisms.* (Exceptions might include the immediate analgesic effect of a cut or burned finger contacting the juice from an aloe vera plant.) In addition, the materialistic contingencies are also indirect-acting for many practices of folk medicine, just as they are for modern, scientific medicine.

Therefore, instead of resulting from the reinforcing materialistic contingencies, many practices of folk medicine must result from their discovery by medicine men who have systematically evaluated the effects of various plants (P. Brown, personal communication, August 1984). So, like other cultural practices, at least some folk medicine must also result from rule governance, rather than direct-acting materialistic contingencies.

FURTHER COMMENTS ON THE MATERIALISTIC BASIS OF RELIGION

We should distinguish between reinforcement that directly maintains a person's participation in the ceremonies of a religion and the materialistic benefits of that participation. I mentioned three reinforcement contingencies that maintain participation: (1) the reinforcement from hearing that one's existing practices will produce supernatural as well as materialistic reinforcers, (2) the reinforcement from no longer hearing that one's current practices are producing negative supernatural sanctions, and (3) the reinforcement from hearing that our enemies are in supernatural trouble. So religious participation is maintained by reinforcement both by the immediate presentation of reinforcers and by the immediate reduction of aversive condi-

tions. (On the other hand, note that, as opposed to *participation* in a religion, *compliance* with the rules of that religion is generally maintained by only one type of contingency—the escape contingency—reduction of the guilt or fear that the religion has caused noncompliance to evoke.)

Yet what about the long-range materialistic benefits? What about the utilitarian notion that religions become popular because they reduce doubt and temptation, allowing the individual more consistently to act "in accord with preexisting useful practices" (Harris, 1985, p. 77)? Is it possible that religious rules can control behavior more effectively than some materialistic rules and that this more effective control helps account for religion's popularity?

The Effectiveness of Religious Rules

As I mentioned earlier, rules are hard to follow, if they specify outcomes that are improbable or small and of only cumulative value. However, rules are easy to follow if they specify probable and sizable reinforcers or aversive conditions, even if those outcomes may be delayed. Now materialistic rules are often hard to follow because they specify improbable or small outcomes. And for the true believer, religious rules are often easy to follow because they often specify outcomes that are certain and sizable, though delayed. Violations of religious rules usually result from ambiguity about the size or certainty of the supernatural outcomes. Violators are usually not true, true believers. So religion has materialistic value to the extent that it allows for the substitution of supernatural rules that are easy to follow for materialistic rules that are hard to follow.

This means we might have much less death on the highways if our churches insisted that each failure to buckle up displeases God and that God or a designated representative (e.g., St. Peter) keeps track of each rule violation and will ultimately call each of those violations to our attention, in a most aversive manner (e.g., one extra day in purgatory per violation—just a suggestion). This also means our churches might significantly impact on dental disease if they would invoke the wrath of God (no matter how delayed) for each failure to floss.

The buckle-up rule needs the support of divine intervention because its materialistic base involves an improbable outcome—an accident. And the "if-you-got-'em-floss-'em" rule needs that divine support because its materialistic base involves outcomes that are small and of only cumulative significance (i.e., any single failure to floss does not matter; no single failure will produce an appreciable increase in periodontal problems).

You need not be a highly skilled introspective behavior analyst to predict that we would get nearly 100% compliance with the buckle-up and flossing rules, if it were certain that failure to comply would result in a day's tending a blast furnace in a steel mill in Gary, Indiana, no matter how delayed that day of reckoning.

So religious rules may exert more effective control over the materialistically relevant behavior of the devout than will the materialistic rules themselves. (Even with a fair amount of backsliding, religious rules may generate this improved control.) Then can this more effective control help account for the popularity of religion?

Why Is Religion so Popular?

I think religion's utility might not help much to account for its popularity with the laity. I doubt if the average Indian farmer worships the cow because such worship will help him resist the temptation of foolishly slaughtering that cow during hard times. He worships the cow because of the immediate reinforcement of thinking he will attain a desirable afterlife and avoid an undesirable one. But the lack of conflict between the religious rules and obvious materialistic rules may prevent countercontrol developing in opposition to those religious rules.

However, religion's utility may account for much of its popularity with social planners and managers. But this

means the planners and managers must know the importance of the materialistic rules and know the support the religious rules provide for behavior that conforms to that prescribed by those materialistic rules. For example, "During droughts and famines, farmers are severely tempted to kill or sell their livestock. Those who succumb to this temptation seal their doom, even if they survive the drought, for when the rains come, they will be unable to plow their fields" (Harris, 1974, p. 15). This is an important set of contingencies in need of any support they can get. The earlier quote of Gandhi's showing his knowledge of the materialistic value of the sacred cow is in keeping with the notion that the planners may have such knowledge.

Harris (1985) further suggests knowledgeable leaders in his discussion of the Israelite ban on pork and other protein sources that were either not worth the effort or were more useful alive than dead: "The food laws in Leviticus were mostly codifications of preexisting traditional food prejudices and avoidances. . . . I envision the Levite authorities as undertaking the task of finding some simple feature which good-to-eat vertebrate land species shared in common" (p. 77). The authorities ended up banning non-cud-chewers and non-split-hooved animals, thus discouraging the growing of pigs (a food supply that, in the long run, was not cost-effective for the group as a whole, in that arid environment) and discouraging the slaughtering of camels (a useful beast of burden). This prohibition of the slaughtering of camels exemplifies the need for the leaders' knowledge of the long-run contingencies involving the ultimate utility of the camels as beasts of burden; it is hard to imagine why they would otherwise be inclined to design taboos to prevent their immediately reinforcing consumption as food. The natural contingencies of reinforcement and punishment (the immediate, direct-acting contingencies) would not support such long-range beneficial actions. Incidentally, Harris (1985, chap. 4) argues convincingly that the Jewish and Muslim pork taboos evolved because of problems of cost-effectiveness and not problems of public health or trichinosis.

Note that the use of religious contingencies may allow the original rule givers, those who understood the materialistic contingency, to set the cultural practice in motion. Then the priests of a society can maintain the practice in the culture, without understanding its materialistic basis; and the original rule givers who understood can fade into obscurity, as Frazier planned to do after he had finished designing the utopian community in Skinner's (1948) novel *Walden Two.*

The Generous Hunter

Consider this use of religious contingencies: "Yanomamo hunters, for example, believe that if they do not share their catch, they will lose their hunting skills" (Harris, 1985, p. 27). The supernatural rule supports a practice that might otherwise be difficult to enforce. The difficulty may not lie so much in the immediacy of the reinforcers for private consumption by the hunter; instead the materialistic benefits to the hunter for one instance of sharing are small compared with the benefits of eating the game himself. The benefits of a single instance of altruism (social approval, the well-being of his family and tribe, and the reciprocity of other hunters) may not suffice to support that altruism, even though the cumulative effects of many instances of such altruism would be significant. Thus, such altruistic rules are often hard to follow and need some sort of supernatural or moral support.

This also exemplifies an advantage of religious rules over rules whose materialistic outcomes are dispensed by other human beings. The other people are not always watching to detect violations and compliance, but God is. You cannot escape omnipresent supernatural forces (Malott & Kent, 1977; Malott & Whaley, 1976, chap. 19).

The Sacred Cow

I have suggested that religion has utilitarian value in that it allows for the substitution of supernatural rules that are

easy to follow for materialistic rules that are hard to follow. In turn, this would suggest (though not of logical necessity) that where we have supernatural rules, we might find materialistic rules that are hard to follow hiding behind them; we might find materialistic contingencies involving outcomes that are individually improbable or individually small and of only cumulative significance.

How would we apply this inverted analysis to the Hindu taboo on eating beef? The materialistic outcome of one bite of beef is small, even though it becomes cumulatively significant (loss of the scarce cattle and their by-products) well before the culture reaches the North American ideal of T-bone steak every night for dinner. On a society-wide level, this could explain the need for the culture of the sacred cow.

What about the individual farmer, tempted to slaughter the cow or ox during hard times? True, the slaughtering produces an immediate, definite, and sizable (negative) materialistic outcome for the animal. But that outcome has little negative biological significance for the farmer until some time later, when he needs milk or needs to plow his field. But those delayed outcomes would seem to be sizable and probable; so why is the prohibition against the slaughter of the cow or ox a rule that is not easy to follow for the farmer? Why does that materialistic rule need the support of a supernatural rule?

We are all good at rationalizing the immediately expedient against our ultimate well-being. And we are, perhaps, increasingly persuaded by our rationalizations, as the expediency increases. So as his family becomes increasingly hungry, the Hindu farmer may kill the cow, rationalizing that he will find another one, that he can plow the field himself without an ox, or that they will sell the farm and live the high life in Calcutta. Then the supernatural rule comes to the rescue, saying, in essence, "You may be able to kid yourself about the negative materialistic consequences of killing your cow, but you know for sure that you are in serious trouble with the supernatural, at least if you are a true believer."

(Incidentally, for those whose anthropological field work consists of looking at Hollywood movies, I recommend the video tape of Pearl Buck's classic *The Good Earth* [Lewin & Franklin, 1937]; the story addresses the dilemma of the starving Chinese farm family and its ox.)

ARE CULTURAL DESIGNERS NECESSARY?

In reading the literature of behavior analysis and cultural materialism, it is easy to infer that materialistic forces control the evolution of cultures without the intervention of designers and managers. However, this is inference by default. This inference results from the limited reference both literatures make to cultural designers and managers. But I have been arguing that such an inference is in error, at least about the evolution and maintenance of human cultures dealing effectively with long-range outcomes. The point of much of this paper is that such cultures must require cultural designers and managers—people who provide the rules that control our actions. Why? Because, as I have suggested, the natural, direct-acting contingencies of reinforcement and punishment will often cause us to act in ways that are counterproductive in the long run, especially as our societies become more complex.

Furthermore, perhaps most of our cultural practices address long-range outcomes. Otherwise, there is no need to have culturally programmed practices, when the materialistic contingencies can reinforce the appropriate actions of the individual—except perhaps to prime those actions, when the operant level is too low.

For example, if we itch, we scratch; and the resulting reduction in the aversive itching reinforces the scratching. We do not need a cultural planner to give us a materialistic rule that advises us to scratch when we itch. And we do not need a planner to tell us God will be unhappy if we do not scratch.

But we do need cultural intervention from our elders to suppress our scratching certain parts of our anatomy in cer-

tain settings. This is because the materialistic penalties for such offensive behavior are too delayed and probably too small (for each individual response) to punish the offending response class.

Now it is true that other primates have also developed cultures (Harris, 1983, pp. 21–26), and they have done so without the benefits of rule-governed behavior. Among the troops of Japanese macaque there is not only the famous culture of sweet-potato washing but also the cultures of breaking the hard stone of the fruit of the muku tree, eating shellfish, keeping social distance, and separating the wheat from the sand—all cultural practices that vary from troop to troop. Among the Gombe chimpanzees there are not only the famous cultural practices of fishing for ants and termites with twigs, but also the practices (presumably cultural) of manufacturing and using leaf sponges for food retrieval and personal hygiene, using sticks and stones to break open fruits, seeds, and nuts, and also using those tools as weapons. However, these practices involve direct-acting materialistic contingencies with immediate natural outcomes that are sizable and probable. Knowledgeable cultural designers need not apply. But the contingencies emphasized in Harris's cultural materialism are generally indirect-acting, and that is a different story.

Do we generally need cultural designers who know about the materialistic contingencies, to develop complex cultures of the sort we have been discussing? The jury is still out, but I believe a radical behavioristic analysis in terms of rule-governed behavior suggests we do need such knowledgeable designers for complex cultures to evolve. That knowledge must come from systematic observation by scientists, engineers, medicine men, or just shrewd observers.

ARE BEHAVIORAL ANTHROPOLOGISTS NECESSARY?

On the one hand, I am not suggesting that anthropology should forego molar laws, such as the fundamental tenet of cultural materialism (i.e., that culture results from materialistic forces). On the other hand, in arguing for the importance of indirect-acting materialistic contingencies, Harris (1980) need not be arguing against rule governance at a more molecular level, for as he notes, "cultural materialism is not addressing the question of how technological inventions and other kinds of creative innovations originate in individuals but rather how they come to exert an influence on social production and social reproduction" (p. 59). However, behavioral anthropology should address "the question of how technological inventions and other kinds of creative innovations originate in individuals." I argue that innovations must result from rule-governed behavior, and that those rules must describe Harris's materialistic contingencies. This is not an argument in opposition to Harris's antimentalism.

So even though the cultural anthropologist and the behavior analyst usually work at different levels of analysis, we also need behavioral anthropologists working simultaneously at both levels, the molecular as well as the molar. We need some discipline straddlers to concern themselves with how these molar forces exert direct, proximal action on the behavior of the individual. Perhaps even the general cultural anthropologist should address the molecular behavioral level as well, because the present molecular analysis does suggest that cultural designers and possibly managers are important participants in developing the rules that support the evolution and maintenance of culture. These participants have thus far not received enough attention in the literature of behavior analysis or cultural materialism.

THE EMIC, THE ETIC, THE MENTALISTIC, AND THE BEHAVIORISTIC

Harris (1987, May) has developed a conceptual framework within which he places the science of cultural materialism, and he has shown considerable concern for the relation between behavioral

anthropology and that framework. So this seems an appropriate point to address that concern from a radical behavioral view.

Harris's framework makes extensive use of two dichotomies: (1) a distinction between *behavioral events* (overt behavior) and *mental events* (covert behavior, thoughts, general self-statements, self-stated rules, or [for the mentalist] mental events); and (2) a distinction between *emic descriptions* (the actor's description) and *etic descriptions* (the observing scientist's description) (Harris, 1983, chap. 1; Lloyd, 1987). Anthropologists with a mentalistic bent may go so far as to restrict the domain of cultural anthropology to mental events, to the mental rules of a society (Harris, 1983, p. 5). Goodenough (1970, p. 103) exemplifies such mentalistic anthropology when he says, "A culture . . . should not be confused with the things people habitually do nor with . . . a material-behavioral system of interacting people and things." Instead, Goodenough emphasizes perceptions, purposes, unconscious motives, decisions, and attributions.

In such a context, it is important to distinguish between the present radical behavioristic anthropological view of covert behavior and rule governance and the mentalistic anthropological view of mental events and rule governance to which Harris objects (Harris, 1980, chap. 9). Therefore, let us consider the following hypothetical study.

Suppose both a mentalistic ethnologist and a behavioristic ethnologist analyze the teaching culture of grade-school teachers who have had a weekend workshop in the ABC's of behavior modification. (I hope this example will make up in didactic value what it lacks in ethnographic charm.) On the emic-behavioral side, the teachers tell the ethnologists that they always catch the children being good—that they pay attention to the children when they are on task and ignore them when they are off task or disruptive. On the emic-mental side, the teachers say they behave so admirably as teachers because they know and follow the rules recommending the reinforcement of desirable behavior by attending to it and the extinction of undesirable behavior by ignoring it; and they say they have decided to follow those rules.

(Incidentally, I do not believe that teachers' reports of rates of disruption by the students are relevant to Harris's dichotomies. When the teachers' use of reinforcement and extinction is the behavior under study, the dichotomies address only the overt and covert behavior directly relevant to their use of reinforcement and extinction. Also, note that the emic-mental description seems to be roughly equivalent to the actors' descriptions of the causes of their behavior, as long as those causes are mental or involve covert processes.)

However, on the etic-behavioral side, both ethnologists describe the teachers' behavior as being just the opposite of that described by the teachers themselves. The teachers attend to the children when the children are off task or disruptive and ignore them when they are quietly studying.

Now on the etic-mental side, the mentalistic ethnologist is likely to provide an inferential description of the mental life of the teachers by saying that they have in their minds rules telling them to attend to inappropriate behavior and to ignore appropriate behavior. Furthermore, those rules may be at the conscious level, or they may be of the deep structural sort. In fact, the failure of the teachers to accurately report those rules may even suggest their inaccessibility due to their being buried so deeply. But regardless of the location of the rules, the mentalist infers rules and rule governance from observed consistencies in the behavior of the actors, especially when the actors' behavior is incongruent with the actors' reports of their mental life. The mentalist may be tempted to infer rules and rule governance from the actors' reports of their mental life, when those reports are congruent with the actors' overt behavior.

On the other hand, the behavioral ethnologist will not provide an inferential description of the actors' mental life and will not infer rules and rule governance simply from observed behavioral con-

sistencies. The reason for this reluctance is that the behavioral ethnologist knows that behavioral consistency may result from the direct-acting contingencies of reinforcement and punishment in the actors' environment. The teachers' attending to disruptive behavior has been reinforced by the temporary termination of that aversive disruption. This reinforcement occurs regardless of whether the teachers are aware of the reinforcement process. Similarly, the teachers' attending to studious behavior has been punished by the disruption of the teachers' other activities, again regardless of the teachers' awareness. (Of course, the behavioral ethnologist would not deal with the actor's mental life, in any case, because the behaviorist denies the existence of any mental life. But the radical behaviorist would sometimes be willing to deal with covert verbal behavior.) (This application of Harris's two dichotomies is shown in Figure 2.)

However, if I were the behavioral ethnologist, and if I were observing teachers who had had extensive hands-on training in behavior modification, and if I observed the teachers reinforcing studious behavior and ignoring inappropriate behavior, then I would probably infer governance by rules describing the nondirect-acting, molar contingencies of behavior modification. Why? Because the processes of reinforcement and extinction are too slow (the students' behavior changes too gradually) to reinforce the teachers' proper use of behavior modification. In other words, behavior modification cannot come under the direct control of the imperceptibly small, though cumulatively impressive, outcomes of each individual act of behavior modification (the reinforcement of studious behavior and the ignoring of inappropriate behavior).

So on some occasions, we do observe behavioral consistency that appears to occur without plausibly effective external contingencies of reinforcement or punishment in the actors' immediate and past environments. And on those occasions, by default, I am willing to infer internal, molecular contingencies of reinforcement and punishment. I infer that the person has stated a rule to herself or himself, a rule describing more molar, indirect-acting, generally external contingencies. The statement of that rule establishes a motivating condition (guilt, fear, etc.) whose termination reinforces compliance with that rule. This inference is strengthened when I observe that the person's past noncompliance with such rules has been punished by the immediate presentation of aversive stimuli or the removal or reinforcing stimuli.

I would argue that this willingness to infer the use of behavioral rules and internal behavioral contingencies should not be mistaken for an inclination toward mentalism. (Such a pair of inferences is not mentalistic. In support of this contention, please consider this analogy: A mind reader has just amazed you by listing your exact social security number, the exact amount of money in your billfold, and perhaps even more useful contents of that violated accessory. As a tough-minded scientist, you doubt that the entertainer has read your tough mind. Instead, you infer that this trickster had access to your billfold and took advantage of that access. You would not think such inferences inclined you toward mentalism. Similarly you should not think yourself inclined toward mentalism if you joined me in inferring other covert activities such as the use of behavioral rules and internal behavioral contingencies.)

Instead of being mentalistic, the inference of rules and contingencies is merely a radical behavioristic extrapolation from public events to private events (Malott & Garcia, in press). I believe such an inference is in the tradition of Skinner's analysis of the role of private events in a natural science (Skinner, 1945; 1953, chap. 17). The inference of the use of rules and covert reinforcement and punishment should not be confused with inference of mentalistic constructs—"a distinct group of conscious or mental phenomena not reducible without remainder to physical phenomena" (English & English, 1958, p. 318).

The rules I infer are behavioral rules—

	EMIC (actor's description)	ETIC (scientist's description)
BEHAVIORAL (overt behavior)	Practices behavior modification	Does not practice behavior modification
MENTAL (covert behavior, thoughts, self-statements, rule statements)	Follows the rules of behavior modification	Mentalistic: follows rules of humanistic concern Behavioristic: shaped by the contingencies of expedience

Figure 2. Harris's four domains of analysis applied to the culture of school teachers.

verbal descriptions of behavioral contingencies (i.e., the situation, the response, and the outcomes of that response). These are not mentalistic or cognitive rules. This means it would not be correct to talk of unconscious rule-governed behavior or the rule-governed behavior of other animals as cognitive psychologists sometimes do. At least it would not be correct to do so, if you agree with me in accepting the behavioristic analysis of consciousness or awareness: people are conscious or aware of something, if they can tact (verbally describe) that thing. And it would not be correct to do so, if you agree with me that other animals normally do not have that verbal repertoire. Instead, unconscious behavior and the behavior of other animals is controlled by direct-acting environmental contingencies (contingency controlled or contingency shaped).

However, an inclination to infer internal contingencies might accurately suggest a willingness to skate on thin ice; it's risky business, but somebody has to do it. The controlling environment does not stop at the skin—only the reach of some of our observations is so prevented.

In summary of the emic and etic descriptions, the behavioral ethnologist differs from the mentalistic ethnologist in that the behavioral ethnologist will rely less on the emic self-description of the behavioral and mental life of the actors. In addition, the behavioral ethnologist will not infer rule governance simply from behavioral consistency. Instead, he or she will rely on an etic description of the observed behavior and will infer rule governance only as a last resort, only when external contingencies of reinforcement and punishment seem absent. It is this willingness, albeit a cautious willingness, to infer rule governance when need be that places such a behavioral ethnologist in the camp of the radical behaviorists rather than the methodological behaviorists.

CONCLUSIONS

In summary, I am suggesting that the materialistic contingencies that form the basis of much of culture are not direct-acting (they specify outcomes that are too delayed, too improbable, or individually too small). Therefore, they do not reinforce or punish the cultural practices. Instead, the materialistic contingencies shift from being behaviorally ineffective to being indirect-acting when they receive the support of the direct-acting behavioral contingencies that are established by the statement of rules. Furthermore, materialistic rules are often hard to follow. So they, in turn, need the support of supernatural rules, which are easy to follow—easy to follow in the sense that they specify sizable and highly probable, though delayed outcomes. And these rules, both materialistic and supernatu-

ral, need knowledgeable cultural designers for their production. In conclusion, I view this rule-governed analysis not as being in contradiction of cultural materialism, but rather as being in support. And in providing support, this analysis suggests areas needing more attention as we attempt to further understand the evolution and maintenance of specific cultural practices.

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